

AIR COMMAND AND STAFF COLLEGE  
AIR UNIVERSITY

**UTILIZATION OF ACUTE CARE NURSE  
PRACTITIONERS TO COMBAT PHYSICIAN  
SHORTAGES IN THE MILITARY TRAUMA SYSTEM:  
WORKING TOWARDS IMPROVED OUTCOMES**

by

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## **TABLE OF CONTENTS**

	<i>Page</i>
DISCLAIMER.....	2
TABLE OF CONTENTS.....	3
ABSTRACT.....	4
PREFACE.....	5
Section I: Introduction.....	6
Section II: Background.....	8
Section III: Options.....	15
Section IV: Evaluation of Options.....	27
Section V: Recommendations.....	28
Section VI: Conclusion.....	30
ENDNOTES.....	31
BIBLIOGRAPHY.....	36

## **Abstract**

The nature of healthcare in the United States is changing. With an ever increasing focus on patient safety, improving overall outcomes and cost containment, new strategies are continually being developed to aid in efforts to provide safe, effective and efficient care. One barrier to this goal is the current national shortage of physician intensivists. As the population ages and increasing numbers of people are living with chronic disease, the need for critical care services is increasing. Current literature supports the utilization of physician intensivists to directly guide care for these critically ill patients in an effort to achieve optimal patient outcomes, however, the growing shortage limits availability of these specialists, potentially increasing morbidity and mortality rates as well as overall costs. While many civilian institutions have begun utilizing modified care teams of physician intensivists and mid-level providers such as nurse practitioners to aid in achieving patient care goals, there is little published to support their use in the military healthcare system.

## Preface

I have been working in healthcare for 24 years, practicing in both civilian and military facilities. Throughout this time, much of my time has been spent working on process improvement projects in an effort to streamline care and improve outcomes. This project came about in response to a decrease in the number of available residents rotating through the surgical/trauma ICU's at San Antonio Military Medical Center at the same time our patient population and acuity numbers increased. Efforts to hire civilian mid-level providers have been unsuccessful, largely due to the decreased pay being offered, when compared to salaries at civilian institutions. Alternative staffing strategies needed to be explored.

I would like to thank first my family, for putting up with the frustrations and cancelled plans as I struggled to learn the very different concepts presented throughout this program and for their many hours spent proofreading papers over and over again. My co-workers who work so hard every day to provide excellent patient care. My supervisor, Col. Richard Strilka, for patiently listening to my many thoughts and allows me the freedom to explore new ideas. Finally I would like to thank my instructors for being so patient with a medic who had no concept of line operations and guiding her through what was undoubtedly one of the greatest learning challenges faced. Your support and understanding is most appreciated.

## **Section I-Introduction**

Healthcare is a rapidly changing industry, with an increased emphasis on patient safety, improving outcomes and containing costs. In November of 1999, the Institute of Medicine shed light on the problem of medical errors with its paper “*To Err is Human.*”<sup>1</sup> It estimated that between 44,000 and 98,000 people die in healthcare facilities each year as a direct result of preventable medical adverse events. As a result of this report, the medical community placed a greater emphasis on finding ways to reduce the number of avoidable deaths. Additionally, a growing commitment to cost containment and fiscal responsibility has resulted in an increased focus not only on eliminating errors and optimizing outcomes, but also shortening length of stay. As a result, national standards for medical care have changed greatly over the course of the last two decades.

In the latter half of the 20<sup>th</sup> century, advances in healthcare technology resulted in a drastically increased expected lifespan.<sup>2</sup> Diseases and injuries that previously had a 100% mortality rate are now survivable. While these diseases and injuries are no longer fatal, patients experiencing them are still extremely ill, requiring monitoring in critical care units for an extended period of time. Research into improving safety and containing costs has shown that these high acuity patients are best cared for in critical care units, equipped with the latest in monitoring devices and employing staff specifically trained to care for extremely sick or injured patients. This includes access to around the clock intensivist coverage. Recent reports however, have demonstrated that the current number of qualified physician intensivists is inadequate to meet growing critical care needs.<sup>3</sup> As civilian institutions increase recruitment and incentives

for physician intensivists, the military can expect its providers to accept these positions and to leave the service prior to being eligible for retirement, resulting in a further decline in the numbers of their experienced critical care providers. As the mission of the Military Healthcare System is to provide total care to the fighting force and maintain readiness to respond to any contingency, including a robust trauma capability, this shortage has the potential to adversely impact the care delivered and ultimately negatively impact overall mission capabilities.<sup>4</sup>

This paper will use a problem-solution framework to answer the question “How can the military trauma system combat the growing national shortage of qualified physician intensivists without adversely impacting patient care and outcomes?” It will present background on the increasing need for critical care services nationwide as well as within the military healthcare system. It will then focus on the need for trauma services and their impact on battlefield survival rates as well as mission readiness. Statistics relating to the growing shortage of qualified physician intensivists will be examined as well as the impact on overall patient outcomes. Definitions of nationally recognized outcome criteria such as morbidity and mortality, length of stay and various complication rates will be provided to establish context. Three potential reactions to the growing shortage will be explored. First, increasing efforts to train and retain physician intensivists, second, utilizing a care model combining the use of mid-level providers

## **Section II-Background**

Each year, more than 18 million days of patient care are delivered in critical care units nationally.<sup>5</sup> This is due in large part to the overall aging of our population. Since World War II, the average life span in the United States has increased by 20 years, resulting in a seven percent increase in those aged greater to or equal than 65.<sup>6</sup> This change in demographics results in a shift in disease patterns, with patients entering the hospital not for an isolated problem, but with a number of co-morbidities that must be managed. These co-morbid conditions such as coronary artery disease, diabetes, renal disease or cerebral vascular disease increase the risk to patients and must be carefully managed, increasing overall patient acuity. These critically ill patients not only tend to experience longer lengths of stay as they recover, but, with their increased need for invasive monitoring and supportive devices and mobility difficulties, they also are susceptible to a variety of healthcare related complications such as pressure ulcers, pneumonia or blood clots<sup>7</sup>. These complications require specific management that further increases length of stay and patients who experience one then have an increased risk not only of developing other complications, but also of long term impairments.

The increase in the elderly population is not the only reason for the increase in the need for critical care services. Improvements in care have resulted in improved outcomes for patients of all ages experiencing illnesses that previously had very low survival rates. These illnesses however, remain very difficult to combat, with patients requiring intensive monitoring and care. While younger patients have fewer co-morbidities and greater reserves than the elderly, they are

often left greatly weakened and immobile for long periods of time, again increasing their incidents of potentially life threatening complications.

On the surface this aging population may not seem to directly impact military medicine during contingency operations, but this conclusion is false. While the majority of military members are healthy with few co-morbidities, there are also a large number of contracted personnel and third country nationals that perform essential tasks in the downrange environment. In Iraq and Afghanistan, 50% of the total workforce was made up of contracted personnel.<sup>8</sup> This civilian population does have the potential to bring with it the problems experienced by much of the population, including heart disease that must then be managed by the military treatment facilities. Additionally, exposure to new stressors and environmental concerns can cause unforeseen negative responses in military personnel, such as heart attacks in response to vaccines or potentially fatal arrhythmias in response to sleep deprivation. All of these issues would require the expertise of critical care providers to achieve optimal outcomes.

Trauma presents a specific set of critical care requirements. Improvements in safety devices and advancements in surgical techniques have resulted in increases in injury survival rates, both from blunt and penetrating trauma.<sup>9</sup> According to the National Institute of Health, in 1985, nearly 18 million people experienced traumatic injuries, with 90,000 of these being fatal.<sup>10</sup> Since then, largely due to a greater understanding of how the body's organ systems react to a traumatic injury, these survival rates have drastically increased. While a 20% burn was almost always fatal in the 1970's, now, a greater than 90% burn has a good chance of survival.

As with critical illness, this increase in immediate survival does not necessarily mean the severity of injury has decreased. A patient ejected from a moving vehicle is not less injured than he or she was 20 years ago, rather advances in technology allow us to provide supportive care for

extended periods while these injuries heal. Elderly patients and those with multiple comorbidities present a unique challenge. Not only must the injuries of the individual be cared for, but often these injuries will exacerbate any underlying conditions that must then also be managed. A young soldier suffering from chronic mild dehydration who arrives with a blast injury now must have his underlying kidney disease reversed in order to fully recover.

Specific to the military, advances in battlefield trauma care have resulted in drastic increases in combat survival rates.<sup>11</sup> While case fatality rates during WWII were slightly over 19%, and Vietnam, 15%, recent data shows that our care of battlefield trauma has increased to reduce that rate to 10% in Iraq and Afghanistan. A large part of this is due to programs such as Critical Care Air Transport Teams (CCATT) or Tactical Critical Care Evacuation Teams (TCCET) that give qualified providers access to injured soldiers at the point of injury or during air transport, enabling earlier intervention when crisis arise.<sup>12</sup> These teams however, further increase the need for qualified providers within the military.

While the need for critical care beds has increased, there is a growing shortage of providers qualified to care for these critically ill patients. Current estimates place the number of critically ill patients being cared for by intensivists at 33%, while the goal is twice that at 66%.<sup>13</sup> To further complicate the picture, the need for critical care services is estimated to grow by another 38% in the near future.<sup>14</sup> This results in a drastic shortfall in trained providers, ultimately leaving this care to be provided by persons with little to no specific critical care training. Within the military system, this results in providers trained as nephrologists, allergists or internal medicine providers being deployed into critical care positions and caring for these very injured or ill personnel. It has long been accepted that critical care patients cared for by trained intensivists experience fewer complications, use fewer resources, receive more efficient care and have

overall shorter lengths of stay.<sup>15</sup> All of these factors combine to improve patient outcomes and decrease costs, making it essential for healthcare to optimize its use of critical care providers, in order to provide safe, cost effective care.

One of the largest factors contributing to overall outcome and cost of healthcare is complication rates and length of stay. A complication is an unforeseen problem that arises as the result of a healthcare related treatment or procedure. These complications can include a wide variety of events such as falls, infections, medication reactions and even death. Despite advances, preventable medical error continues to remain the number three cause of death in the United States.<sup>16</sup> In terms of healthcare costs, a 2008 study examining the impact of health care related complications in Maryland and California estimated that the care required for treating these unforeseen events was directly responsible for raising the cost of a hospital stay by 9%.<sup>17</sup> In an effort to combat the rising costs of healthcare, the Centers for Medicare Services (CMS) in response to the Deficit Reduction Act of 2005, announced it would no longer be reimbursing facilities for the costs associated with treating “never events” or complications that should never occur. This list, now 29 items long, spans the continuum of care and includes categories such as surgical errors and wrong site surgery, patient harm due to equipment failure and errors in patient care. In the critical care arena, the large number of medications and treatments prescribed increases the odds that one of these care related never events, such as a medication error, failure to recognize and properly treat lab or radiology results or transfusion reactions is increased. Additionally, the large number of invasive devices used to support a patient throughout the healing process increases the likelihood of other reportable complications. These include Ventilator or Healthcare Associated Pneumonias (VAP/HAP), catheter or central line related infections, deep vein thrombosis (blood clots), or delirium (ICU psychosis), all of which have the

potential to be fatal if left untreated. Prevention of these complications in the critically ill population requires an extensive understanding of the pathophysiology of critical illness and an overall understanding of how all of the body systems react in times of intense physiological stress. A neurosurgeon, focusing on the brain, may not realize that the medication that was ordered to prevent blood clots may in fact be making the patients underlying kidney issues worse. Each specialist, focusing on their own body system, may fail to see the larger picture, causing un-intended complications. It is the job of the intensivist to coordinate this care and reduce, if not eliminate these issues. This can be especially important in the trauma unit where illness and injury work against each other to complicate patient care and many different specialty services are all required to work together in an effort to return the patient to an optimum state of health. Timing and prioritization of surgeries, treatments and tests can have a large impact on overall outcome and is best accomplished by one person or team who has oversight of the patient as a whole.

Every treatment, medication or procedure experienced by a patient is an opportunity for an error or complication to occur. As such, the longer a patient stays in a health care facility, the greater his chances of experiencing an adverse event. With the large number of treatments prescribed to critically ill patients and the increased potential for adverse reactions to these treatments, these patients are at a higher risk than any others. To reduce this risk it is essential that care be optimized in an effort to shorten the length of stay of a patient, both in the critical care unit and in the hospital. Shortening length of stay not only reduces complication rates, it also reduces overall cost to the patient. Currently the cost of a trauma critical care bed is \$2,841.47/night while critical care nursing is billed at \$63.66/hour or a total of \$1,527.84 a day, for a total of \$4,369.31 in simply room and nursing costs per day. In comparison, the cost for a

progressive care, or stepdown bed is dramatically lower, at \$1,592.37/night, with nursing care being \$57.80/hour, resulting in a total difference of \$1389.74 of cost to the patient per day.<sup>18</sup> As many trauma patients are un-insured, this reflects as revenue lost by the hospital in unpaid bills. At San Antonio Military Medical Center (SAMMC), the only Level 1 trauma center in the Department of Defense, the trauma critical care units cohabit with the surgical critical care patients. When beds are full, surgical services are referred out to the surrounding civilian markets. Shortening length of stay re-opens these beds, allowing for the recapture of some of the \$1.8 million dollars in referred revenue from the Department of Surgery each year.<sup>19</sup>

Overall, the patient access to a trained intensivist reduces the risk of adverse complications, improves outcomes, reduces mortality and shortens length of stay. In a statement by the Society for Critical Care Medicine (SCCM), it was estimated that the use of an intensivist results in \$13 million in annual hospital cost savings.<sup>20</sup>

Access to an intensivist by patients in critical care units has been demonstrated to shorten length of stay, improve outcomes and result in an overall cost savings both to the patient and the healthcare facility. If the DoD is to continue providing high quality cost effective care to its beneficiaries it is essential that it continue to staff its critical care units, both stateside and in deployed locations with trained intensivists. With the worsening shortage however, this may be difficult without formulating a plan and beginning to take action now. Three options are available for combating this looming crisis. In evaluating options, three criteria will be utilized. First, impact on patient care will be examined. A viable solution must not have an adverse impact on the quality of care delivered. Morbidity and mortality rates must be equivalent or improved over those currently seen when providing care in accordance with national standards. The solution must be able to continue to provide quality care to the sick or injured downrange as

well as those in non-deployed facilities. There should be no increase in the cost of care provided. Second, the implementation of the solution should be cost effective. Initial training and implementation costs should be at least equivalent if not improved in order for a solution to be chosen. Finally, time involved should be examined. Any solution should be able to be implemented in a timely manner in order to avoid a potential decline in the quality of care delivered in the short term. All of these criteria will be utilized in an effort to determine the best solution.



## **Part Three-Options**

### **Option I-Increasing the number of intensivists**

The first option is the recruitment and training of more physician intensivists. A physician intensivist is a provider who has completed a bachelor's degree and then four years of medical school as well as a residency in surgery, medicine, pulmonology or anesthesia, and then returned to complete a further two or three years of fellowship training specific to critical care.<sup>21</sup> At the end of this period, fellows are required to sit for a board examination in critical care and only after passing, are they considered to be intensivists. For a trauma surgeon at SAMMC, this amounts to a total of four years in medical school, six years in surgical residency and another two years in trauma surgery fellowship, for a total of twelve years of required training. During this training time, the potential intensivist is non-deployable and must work supervised by an attending physician intensivist. This supervisory requirement results in either fewer numbers of attending physician intensivists being available to deploy in order to fulfill this obligation or, those intensivists who are not deployed will be required to work longer hours to compensate, increasing the risk of fatigue based errors.

The cost of training a military physician intensivist can be high. The average cost of medical school in the United States today is over \$207,000.<sup>22</sup> Those attending the Uniformed Services University of Health Sciences Medical School are paid as 2<sup>nd</sup> Lieutenants during their school time, with a base pay of between \$35,000 and \$44,000 annually. Upon graduation, they spend their residency being paid as a Captain, with a base pay of \$47,000-\$63,000 annually. Finally, their two years of fellowship are paid as a Major, \$54,000-\$67,000 per year as a base pay, for a total of \$530,000 to \$688,000 in base pay while in a training status.<sup>23</sup> Additionally, there are

bonuses and housing allowances, depending upon the area where the training takes place. For SAMMC, a large military teaching facility, the housing allowance for a Captain amounts to \$1707/month, for a total of \$122,904 over the course of a six-year residency and an additional \$47,880 in BAH as a Major for the fellowship period.<sup>24</sup> Overall, the cost of training a physician intensivist in the military in schooling, salary and housing can easily be in excess of \$1,000,000.

Patients cared for by physicians certified in critical care have better outcomes than those who are not. The Leapfrog Group, a group dedicated to promoting healthcare safety and transparency estimates that the mortality rate for patients in critical care units with access to around the clock access to intensivists is 40% less than that for critical care units without such high-intensity staffing.<sup>25</sup> High intensity staffing is defined as an intensivist being available in the unit within daytime hours and available by phone to answer questions or direct care within 5 minutes at all times of the day. For a Level 1 trauma center, this also requires a trauma surgeon to be available in house around the clock. This trauma intensivist cannot be the ICU staff intensivist, as they are often called to the operating room and will not always meet the criteria for being available.

The time criteria for high intensity staffing is important. Critically ill patients, and trauma patients in particular can decompensate quickly, leaving little time to react to changes in condition. In low oxygen states, permanent brain damage can occur within three to six minutes, resulting in a less than optimum outcome. Prompt intervention, directed by a provider with full knowledge of the patient's condition and course of treatment is essential to prevent permanent disability.

Within the Air Force, there are a large number of areas where intensivists function. Trauma surgeons serve a vital function downrange caring for wounded warriors experiencing battlefield trauma, both in the field and in the role two and three facilities. Their primary function is

directing the operative care of all wounded. As a trauma surgeon can be called to the operating room on short notice, care of the wounded in the critical care units preferably falls on an intensivist with a non-surgical background, however, at times, a specialty physician without intensivist training is utilized. Intensivists are also a primary component of transport teams, such as CCATT or TCCET, as well as the newer forward surgical teams and are occasionally attached as medical support to special operations teams.

As the need for physician intensivists grows, reimbursement packages offered by civilian organizations have the potential to lure qualified providers away from the military. The 2016 Intensivist compensation report shows that the average salary for intensivists nationwide is \$306,000 annually, an increase of 8% over 2015 salaries.<sup>26</sup> This is in stark contrast to the annual base pay of a military major with over 12 years in service of roughly \$85,000 annually.<sup>27</sup> This is a difference of \$221,000 a year in salary, an amount that would be nearly impossible to make up with allowances and bonuses. This increased income, combined with the lack of deployments and stable home atmosphere makes the transition to a civilian career very tempting for many military officers, potentially worsening the physician intensivist shortage within the military.

## **Option II-Utilization of Nurse Practitioners**

A second option for combating the physician intensivist shortage while continuing to provide cost-effective high quality care is to transition from a physician only care model to a team based model utilizing specially trained mid-level providers to augment the number of available physician intensivists. Mid-level providers are generally considered to be nurse practitioners (NP) or physicians' assistants (PA) who can specialize in a wide variety of areas. As the newest subspecialty of NP's, the Acute Care Nurse Practitioner (ACNP) is specifically trained in the care of patients with acute and critical illnesses.<sup>28</sup> An ACNP will generally function in an inpatient hospital or emergency room environment. ACNP's are registered nurses who have completed four years of training and received a Bachelor's degree in nursing, prior to returning to school to complete a graduate degree focusing on the care of the acutely ill or injured patient. While traditionally this was accomplished at the Masters level, recent trends are advocating for the minimum entry level educational requirement be changed to a Doctorate.<sup>29</sup> As a result, the majority of accredited schools have now transitioned their programs to a Doctorate of Nursing Practice (DNP).<sup>30</sup> These programs generally take three to four years to complete, considerably less than the time required to complete medical school, residency and fellowships. Additionally, in an effort to increase care for the aging population, all programs now contain a specific focus on care of the geriatric patient. Leading hospitals such as Vanderbilt and University of Maryland have also implemented fellowship programs for their newly graduated ACNP's to build upon and enhance the critical care skills acquired during the educational process. These programs generally last an additional nine months to one year.

Providing cost-effective, safe, high quality care is the goal of any healthcare organization. In an effort to continue to be able to accomplish this goal, many civilian organizations have altered

their care models to include mid-level providers. These new multi-disciplinary teams utilize an attending intensivist to oversee the care delivered within the critical care units, while the daily management is accomplished by ACNP's or PA's. As an ACNP is considered to be a licensed independent provider and has a greater level of autonomy than a PA, many facilities are focusing their efforts in that direction. This team model allows one attending intensivist to maintain safe oversight of a greater number of patients, while still being available for emergent situations. Originally proposed by the Institute of Medicine Best Practice Collaborative, these team based models have since been endorsed by a number of professional medical organizations, including the American Association of Nurse Practitioners.<sup>31</sup>

Multi-disciplinary teams have been demonstrated to provide safe care to patients at a level equivalent to that provided by physician intensivists alone, and meta-analysis conducted by nursing researcher Robin Newhouse concluded that ACNP's provide safe, effective quality care in a number of clinical settings.<sup>32</sup> When comparing care by NP's to physicians in the civilian environment, indicators such as patient satisfaction, perceived health, functional status, glucose and lipid control, blood pressure, rates of rehospitalization, ventilator days, length of stay, and mortality were found to be at least equivalent.<sup>33</sup>

While the literature from the civilian community is generally favorable, there is little data examining outcomes in military critical care units. In 2012, the role of the ACNP within the surgical/trauma ICU at San Antonio Military Medical Center was expanded from an oversight capacity to including direct patient care. Since that time, there has been a steady decline in overall complication rates, overall morbidity and mortality and ICU length of stay.<sup>34</sup> In addition, several ACNP based process improvement initiatives have resulted in improvements in overall functional outcome, shortened ER dwell times and increased nursing satisfaction.

Many military facilities with critical care capabilities are also teaching facilities, resulting in large numbers of residents rotating through the critical care units on a monthly basis. This rotation can potentially cause a lack of continuity in care as teams are completely changed every 30 days. Continuity of care is essential for achieving optimum patient outcomes. Important information from early on in a patient stay can be lost as residents leave the service. This is another important role that can be filled by the ACNP. By having permanently assigned mid-level providers in the critical care units at all times, it is possible to track changes in patient care over the long term. Fewer details are missed or forgotten as residents leave, or with the weekly change in attending intensivists. Reduction in troop size is also resulting in fewer residents rotating through critical care areas.<sup>35</sup> This has an adverse impact on patient care as those who do rotate are forced to care for increasing numbers of patients, resulting in a higher provider to patient ratio. Higher ratios result in a loss of attention to detail, less attention paid to individual patients and an overall increase in adverse outcomes. An increase in the number of mid-level providers could potentially combat this loss of residents, again reducing the number of patients each provider cares for and allowing for the necessary attention to detail required for optimum patient recovery. In smaller facilities, a mid-level provider fill in for an intensivist, taking night or weekend call, providing the around the clock access to care necessary for best outcomes.

From a readiness perspective, the ACNP can fill a variety of critical roles to facilitate mission objectives. Currently, the deployment platform of an ACNP is as a provider on a tactical critical care evacuation team. The objective of these teams is to improve survival rates by placing skilled care providers as close to the point of injury as possible, enabling care to be provided prior to the arrival of a casualty at a role two or three facility. They are capable of providing a higher level of care than that provided by a combat medic alone. Additional roles could be filled

by a mid-level provider. As previously discussed, critical care units in the role three facilities are staffed by physicians with varying degrees of critical care experience. Some of these specialists, while they may have experience caring for a patient in critical condition usually only care for one specific system or aspect of their overall care requirements, rather than maintaining oversight of the patient as a whole. Physicians who are trained as intensivists are often repeatedly deployed, potentially leading to burnout or difficulties with post-traumatic stress.<sup>36</sup> Some of this burden could be relieved with the use of an ACNP to fill the role of the second intensivist. By utilizing a care team model, primary oversight could still be maintained by a physician intensivist and/or trauma surgeon, however, the daily management could be accomplished by a trained mid-level provider.

Utilization of mid-level providers has been shown to provide cost effective care. As previously explored, the cost of training an intensivist can quickly reach \$1million over the course of their training while. According to the American Association of Colleges of Nursing, the cost of educating an ACNP is approximately 25% that of preparing a physician. Additionally, while the average salary of \$306,000, the national average for NP's is \$97,000 per year.<sup>37</sup> This figure is more in line with military pay scales, with the average major earning \$85,000 annually.<sup>38</sup> The monthly and retention bonuses received by military mid-level providers are also considerably less than that received by specialty physicians, with the monthly bonus for an ACNP being \$166.66, resulting in an overall cost savings.<sup>39</sup>

As an independent provider, an ACNP also has the potential to improve throughput within an organization, facilitating discharges and transfers of patients who no longer need critical care or hospitalization. Improving throughput provides a variety of benefits. By discharging patients from the hospital in a timely fashion, it frees up valuable bed space for patients requiring

surgeries or transfers from a higher level of care. This timely discharge not only reduces complication rates, it also increases revenue. When beds are full, there is the potential for elective procedures to be cancelled, or referred out to the surrounding civilian healthcare community. Improving throughput allows for the recapture of some of this lost revenue. It also aids in ensuring that beds are available for those patients who no longer require ICU care. As previously discussed, the cost per night of a critical care bed and nursing care is considerably higher than that of a stepdown or floor bed. When no beds are available it is not uncommon to have non-critically ill patients remaining in the ICU for several nights, waiting on availability.<sup>40</sup> This again results in lost revenue as these nights are reimbursed at the lower rate, despite the actual patient location.

An ACNP is also able to increase revenue, acting as a workforce multiplier, caring for patients and performing tasks and procedures independently, allowing the attending physician to focus on other necessary tasks. While still in the early phases of investigation, computer simulation models are demonstrating that the multi-disciplinary care team model has the potential to increase revenue to a facility while at the same time continuing to provide high quality care.<sup>41</sup>

There are several difficulties with the data when examining the impact of ACNPs on the critical care population and translating that into the military setting. Currently there is no data examining the impact of nurse practitioners in the role 3 facilities and little data on their effectiveness on the TCCET teams. The majority of the data is also from the civilian trauma sector, a large portion of which comes from a select few facilities. While there is currently a study in progress that examines the impact of the mid-level team on patient outcomes in the surgical/trauma ICU at SAMMC, it is utilizing the patient of the medical ICU as the control

group. While some similarities can be drawn, these two patient populations are not equivalent, so results from one population cannot be generalized to the other. Additionally, facilities currently utilizing nurse practitioners in the critical care environment often have a fellowship program of nine months to one year to provide the specific training needed to operate independently in the critical care arena. Currently the military has no equivalent program.



### **Option III-Continuing Current Recruitment Strategies**

The final option is to maintain the status quo, relying on current recruitment methods and retention to maintain the needed number of intensivists. This plan however has the potential to result in a decline in patient care and increases in complication rates. Of physicians with an initial four-year service obligation, it is estimated that only 50% are retained beyond their initial commitment<sup>42</sup>. With 50% of our experienced providers leaving the service, the burden on those left is then increased to continue training replacements, as well as cover downrange deployments. These deployments during the initial commitment phase have been associated with increased rates of separation among many medical subspecialties.<sup>43</sup> Those that are not deployed shortly after becoming fully qualified however tend to see these later deployments as career enriching opportunities and are more likely to stay in the service.<sup>44</sup> Practice location also tends to play a role in the decision to stay in or leave the service. Physicians initially assigned to the larger MTFs such as San Antonio Military Medical Center or National Naval Medical Center at Bethesda have greater job satisfaction than those assigned to smaller facilities. This can be problematic for Air Force physicians however, considering of the six major medical facilities currently in operation, three are owned by the Army and three are Navy. While many are considered to be “joint” facilities, many Air Force personnel feel that they are not utilized to their fullest scope of practice or have fewer opportunities for leadership roles while assigned to these facilities.<sup>45</sup> Frequent moves, administrative difficulties and long work hours with compensation below that of their civilian counterparts have also been seen as reasons for early separation.<sup>46</sup>

As discussed, a shortage of intensivists has the potential to lead to declines in the overall quality of care that is provided to critically ill trauma patients and beneficiaries. Critical Care

units can be divided into two categories. High intensity, or those units who are considered “closed” units or that have a mandatory intensivist consult requirement, or low intensity units, who are “open” or have an optional consultation requirement. Closed units are those units where the attending physician of record for a patient must be a qualified intensivist and all care is then directed by that intensivist or intensivist team, with support from their primary team. An open unit allows any physician with privileges at a facility to admit to the ICU. Currently at San Antonio Military Medical Center, the surgical/trauma ICU’s are open units, but the intensivist team is automatically consulted, unless this consult is specifically refused by the attending physician. As a result, it is considered to have high intensity staffing. Should the numbers of staff intensivists decline, there is the potential for the unit, as an open unit, to shift to a low intensity model.

In a meta-analysis examining critical care physician staffing, 27 staffing strategies were examined for overall mortality rate, ICU mortality rate, length of stay and ICU length of stay. In 16 out of 17 studies, high intensity staffing was associated with lower overall mortality, while 10 out of 13 studies demonstrated a reduced hospital length of stay. Numbers for ICU mortality and length of stay were also lower in the high intensity staffing group, while no studies found an increase in either length of stay.<sup>47</sup> In a deployed environment, this increase in mortality and length of stay translates into increases in combat casualty rates as well as an increase in the recovery time for combat wounded, decreasing the overall available fighting force.

Not only does length of stay impact overall patient outcome, it also impacts overall revenue, as fewer beds are available for new patients and surgeries have the potential to be delayed or referred out to the civilian market. Currently SAMMC refers 1.8 million dollars in surgical

services to the surrounding area. Funding that could be recaptured with increased throughput and shortened lengths of stay.<sup>48</sup>



## **Part IV-Evaluation of Options**

Evaluation of the potential plans will take three different criteria into account. Patient safety and outcomes, cost and time involved. In terms of patient safety and outcomes, including mortality, length of stay and rates of complications, recruiting and training more physician intensivists and utilizing nurse practitioners are equivalent when examining data from the civilian population. There is however no data specifically examining data from a military treatment facility. While the civilian data could be generalized to the non-deployed military environment, it would be difficult to say it is equivalent. Maintaining the status quo would be the least viable option for maintaining quality patient care.

When looking at overall cost, it is considerably less expensive to train an advanced practice nurse to function in a critical care environment than it is to train a fully qualified physician intensivist. Additionally, the potential cost savings in increased efficiency and improved outcomes along with recaptured revenue by improving throughput makes the utilization of mid-level providers the better option over training physician intensivists or maintaining our usual recruitment and retention methods.

In terms of time, with medical school, residency and fellowship, it takes considerably longer to train a trauma intensivist than it does to train an advanced practice nurse. Decreasing the training time shortens the timeline toward improving outcomes and throughput and alleviates the pressure placed by the growing shortage of physician intensivists on patient care. Maintaining the status quo requires no time, however, will cause difficulties with maintaining standard of care as intensivist leave the service.

## **Part V-Recommendations**

While on the surface it appears that the utilization of Acute Care Nurse Practitioners within the military trauma system would do a great deal to alleviate the shortage of physician intensivists as it has in the civilian population, there is room for further study. In order to truly understand the impact of the ACNP on the military healthcare system in both the deployed and stateside roles, several things need to happen.

1. A fellowship program needs to be established at SAMMC to ensure newly graduated nurse practitioners are adequately trained to function in a military critical care environment. This program would mirror the programs established at civilian facilities including clinical rotations through a number of critical care areas, including surgical trauma and burn ICU to establish the skills necessary for caring for combat wounded. Currently SAMMC is the only level one trauma center in the DoD and has a total of five different critical care arenas, giving the largest number of learning opportunities to potential nurse practitioners.
2. The deployed role of the ACNP would need to be expanded to include being the second critical care provider in a role 3 facility, with the primary provider continuing to be a fully qualified physician intensivist. It would be necessary for these nurse practitioners to be experienced in critical care and signed off by their department head as able to function independently in a critical care arena prior to deployment. This would allow for the data collection necessary to determine overall impact.
3. A further study of ACNP effectiveness in the surgical/trauma ICU should be undertaken. Optimally this would utilize a control group of similar patients. As SAMMC currently has two surgical/trauma ICU's that see similar patients it would be possible to staff one unit utilizing an

intensivist team-based model with nurse practitioners and physician assistants while the other is staffed with the current attending/resident staffing plan. To assist in eliminated confounders such as variances in nursing care, the teams could change units after a pre-designated period of time such as six months. Outcomes could then be compared and conclusions drawn. To accomplish this however, the current number of mid-level providers on the trauma service would need to be increased from eight to a minimum of 14. As the trauma department is currently attempting to raise the total number of nurse practitioners on service to 20 over the course of four years, and there are a number of nurses trained as nurse practitioners who are not currently functioning in the role, this number is easily achievable.

As a result of this increased need for study, and the time required to train an intensivist, it is recommended that two options be implemented. First, there needs to be an increased effort to recruit, train and retain qualified trauma intensivists to combat the current shortage and ensure mission readiness for any future conflicts. Second, the number of ACNP's functioning in military critical care units both stateside and in deployed locations needs to be increased to ensure continuity and quality of care. Use of the ACNP role has proven to be a safe and cost effective option in the civilian community however, more data will be required to demonstrate an impact upon military mission readiness. Taking a proactive stance and increasing efforts in the education and training of nurse practitioners also helps to alleviate the impact of any future intensivist shortages while adequate numbers of physicians are trained.

## **Conclusion**

The growing shortage of physician intensivists presents a risk to critically ill beneficiaries of military treatment facilities world-wide. In both the stateside and deployed environments, providers trained in caring for ICU patients are essential for optimal outcomes. Increasing the number of fully qualified physician intensivists is costly and time consuming, large scale use of acute care nurse practitioners requires further study and continuing current practices is potentially detrimental to overall patient care and readiness. Continuing to provide safe, cost-effective care while maintaining mission readiness will require a coordinated effort to increase the number of physician intensivists as well as the number of acute care nurse practitioners. It is only by accepting the new paradigm of multi-disciplinary patient care that the military will be able to meet the healthcare challenges of the future.

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